

of applications of pesticides and herbicides will be sought throughout the unit. Vegetation control practices would be modified to support the recovery of native plants such as perennial grasses and wetland species. The health of the upper creek watersheds will be enhanced by reducing the potential for wildfires in riparian and forest woodlands through forest fuels management and improved fire suppression.

Limited wetland areas located in the eastern portions of the unit adjacent to the Sacramento River should be protected and expanded. Stream flow into the wetland-slough complexes should be improved. Water quality should also be improved. Natural floodplain processes should be enhanced through setback levees, stream meanders, and seasonal flood overflow basins, which in turn should reduce peak flood flows to the Sacramento River and water levels in flood-prone portions of the unit.

LOWER AMERICAN RIVER ECOLOGICAL MANAGEMENT UNIT

The vision for the Lower American River Ecological Management Unit focuses on restoring important fishery, wildlife, and plant communities to a condition in which the status of specific resources is no longer considered to be of concern within the unit. Restoration within the American River will, in turn, contribute to restoring aquatic resources of the Bay-Delta. This vision will be accomplished by restoring or reinitiating important ecological processes and functions that create and maintain important habitats for fish, wildlife, and plant communities along the lower American River. Numerous and diverse actions may be implemented taken on a broad scale to restore and maintain sustainable, naturally spawning stocks of chinook salmon and steelhead in the American River, including improving seasonal flow and temperature regimes, in-channel and riparian habitats, fishery regulations, and hatchery operations.

Restoration efforts will emphasize benefits to naturally spawning chinook salmon and steelhead populations, which coexist with non-native American shad and striped bass and hatchery stocks of chinook salmon and steelhead. Harvest of naturally produced chinook salmon and steelhead will be regulated to ensure sustained recovery. Recreation along the river will be enhanced by improving flows and habitats and expanding populations of salmon, steelhead, American shad, and striped bass. These actions will

also help to sustain the natural aesthetic quality of the stream channel and the associated riparian corridor and floodplain while allowing both consumptive and nonconsumptive uses of the fish, wildlife, and plant resources of the area.

The American River Flood Control Project, the lower American River Parkway, operations of Folsom and Nimbus dams of the CVP, and the designation of the parkway as a State and federal Wild and Scenic River are essential elements that will guide the restoration of ecological health of the American River Basin Ecological Management Zone.

Restoration activities are directed at improving seasonal stream flow and water temperatures, spawning gravel resources, and stream channel configuration and habitat, and riparian corridor management. These processes, in turn, will support development and maintenance of spawning and rearing habitat (e.g., physical habitat, water temperature, and food supply). To support populations of naturally spawning steelhead trout, fall-run chinook salmon, American shad, and resident native fishes, the natural stream flow pattern and spawning and rearing habitat need to be improved. Of these actions, improving seasonal stream flow and water temperature have been identified by the Lower American River Technical Team as being of greatest importance in restoring anadromous fish populations in this river.

For the American River, improving spring (i.e., March through May) flows would help steelhead and American shad move upstream into the American River during their traditional spring migrations. Such flows during these months could also benefit older juvenile fall-run chinook salmon and steelhead migrating downstream to the estuary and ocean after rearing for an extended time. Moreover, improved spring flows would also benefit stream channels, gravel transport and cleansing, and riparian vegetation in the lower river, which, in turn, will benefit fish. Improved flow from the American River in spring would also enhance survival of American and other river anadromous fish during their passage downstream through the Delta to the Bay and ocean.

In addition to spring flows, flows are also needed in other seasons to protect juvenile salmon and steelhead rearing and migrating in the river. In some cases, flow needs exceed natural, unimpaired river

flows below Nimbus Dam, because these juvenile fishes must rear in the non-traditional habitats of the lower river instead of the upstream reaches above the dams. Managing flows and water temperatures is necessary to optimize use of limited water resources. Doing so would require alternative operation of the water release shutters at Folsom Reservoir's power penstocks and physical modifications to the urban water intake structures to facilitate the diversion of water from Folsom Dam at elevations other than 317 ft (msl).

Habitat improvements in the lower American River are necessary to increase spawning and rearing habitat quality and quantity for salmon and steelhead to improve natural production of these anadromous fish species. Improved spawning habitat will lead to increased production of young salmon and steelhead. Improved stream channel and riparian vegetation will increase the availability of essential spawning and rearing habitat available for chinook salmon and steelhead. Some changes to the stream channel could reduce warming of the river and provide fewer refuges for warm water predators.

Many of the deficiencies identified in ecosystem processes in the American River can be remedied by improving water management and modifying aquatic and terrestrial habitats. For example, side channels can be restored along with SRA habitat to provide rearing habitat and reduce heating of the river. Much of the needed gravel for the river is stored in and along the river but is unavailable because of armoring or is stored on higher terraces and in dredger tailings. Restoration efforts can focus on reconfiguring the existing channel, redistributing available gravel supplies and restoring riparian vegetation while maintaining or improving the flood capacity of the channel.

Ameliorating or eliminating these problems would require long-term intervention and maintenance beyond simply replenishing the gravel supply of the American River. Although redistributing available gravel and improving the gravel permeability of salmonid spawning grounds is an important element of the vision, reconstructing and maintaining the channel also would be critical aspects of the effort. For example, much of the natural channel has become incised and armored, because sand and gravel appropriate for spawning have been continually eroded without being replaced.

Adequate seasonal flows to sustain salmon and steelhead populations are not always available in the American River. This is especially true for flows during spring through fall in drier than normal water-years. Additional water releases will be made possible from Folsom Lake storage, through purchases of CVP water from willing sellers for fish and wildlife, revised guidelines for operation of the CVP and State Water Project (SWP), water transfers, and/or purchases of water conserved from other sources using available restoration funds.

Reaching this vision for the American River Ecological Management Unit will also require reducing the adverse effects of illegal and legal harvest, hatcheries, and contaminants from urban drainage on lower American River aquatic resources. The following section describes additional visions or objectives for restoring key ecological processes, habitats, and important species of the American River.

VISIONS FOR ECOLOGICAL PROCESSES

CENTRAL VALLEY STREAMFLOW: Though many of the streams in the American Basin are naturally intermittent, maintenance of the natural winter and spring flows in the streams is important for maintaining floodplain processes such as meander belts and stream channel configurations, as well as riparian and wetland habitats. Stream flows also attract salmon and steelhead to the creeks of the basin beginning in fall, and transport young salmon and steelhead downstream in winter and early spring. Adequate streamflows are important for maintaining native rainbow trout/steelhead through the summer in upper Coon Creek, Auburn Ravine, and Dry Creek. Some stream flow is also needed to support native resident fishes through the summer-fall irrigation season. The vision for stream flow is where possible natural streamflows will be retained in creeks to support riparian habitat and important species. This may involve reduced diversions or increased inflows either from increased inter-basin diversions or other sources of water (i.e., groundwater or recycled water).

Streamflows shape river channels, support riparian vegetation, and provides habitat for fish and other aquatic organisms. The vision for streamflow in the

American River below Nimbus Dam is to more closely emulate the natural flow regime of the river through operating changes in the allocation of the available water supply of reservoirs and reducing demands on water supply in drier years to maximize direct benefits to lower American River anadromous fishery resources. Improvement in spring flows also will provide indirect benefits by supporting naturally occurring seasonal flow patterns in dry and normal years that supports many ecological processes/features essential to the health of anadromous fish populations.

COARSE SEDIMENT SUPPLY: Sediment supply is an important watershed attribute that contributes to stream channel meander and maintenance of riparian systems. Sediment supply and gravel recruitment on the American River is impaired because recruitment from upstream is blocked by Folsom and Nimbus dams. The vision is to redistribute and/or supplement gravel to provide continual replenishment of gravel for chinook salmon and steelhead spawning habitat. Activities implemented to reach this vision will be consistent with flood control requirements.

STREAM MEANDER: A natural stream-meander process in the American River is no longer possible because of dams, flood-control levees, remnant effects of dredger mining, and altered flow patterns. The vision is to sustain some semblance of a natural stream meander corridor to the extent possible to sustain the diversity of habitats that depend on a natural meander, and to dissipate the energy of the river.

NATURAL FLOODPLAIN PROCESSES: In addition to changes in stream flow, floodplains processes have been altered by floodplain development including flood control levees, reclamation of wetlands for agriculture, gravel mining, and other land uses. The vision is where possible natural floodplain processes will be preserved by allowing winter-spring flows to overflow into riparian and wetland habitats. Natural stream meanders will be encouraged by removing where possible constraints on meander belts such as levees and bank protection in the lower floodplain portions of the creeks. Natural floodplain overflow will help to collect floodwaters and sediment, and help to dissipate the erosive forces of flood waters.

CENTRAL VALLEY WATER TEMPERATURES:

Beginning in spring when streamflows in the creeks decline after the rainy season, water temperatures in the creeks increase naturally with the warm Valley air temperatures. The creeks do not cool again until fall. Water diversions, irrigation returns, riparian habitat degradation, and urban runoff alter this natural pattern. Springs, diversions from other watersheds, and higher elevations maintain cool water habitat in the upper watersheds of Coon Creek, Auburn Ravine, and Secret Ravine. The vision is provide cooler spring through fall water temperatures in these watersheds by protecting and enhancing stream flow where possible, enhancing riparian vegetation along creeks, reducing warm water discharges to the creeks, and reducing diversions from the creeks.

High summer and fall water temperatures limit salmon and steelhead production in the American River. The vision is to control water temperatures in the lower American River, to the extent possible, to maintain and contribute to the restoration of chinook salmon and steelhead populations and to avoid high water temperatures which cause mortality or result in other adverse effects to young steelhead (e.g., reduced growth), or delay fall spawning of salmon.

VISIONS FOR HABITATS

SEASONAL WETLANDS: Seasonal wetlands, including vernal pools, are important habitat for many species of fish, wildlife, and waterfowl. The vision is to protect existing areas of seasonal flooding and to maintain or expand sources of water to promote higher quality wetlands especially in drier years. Areas where seasonal flooding develops seasonal wetlands will be expanded. Flooding easements will be obtained from willing landowners to provide seasonal wetlands in flood prone areas such as Natomas Basin and lowlands to the east.

RIPARIAN AND RIVERINE AQUATIC HABITAT: The vision is to fully protect and restore riparian and riverine aquatic habitats to maintain and enhance to support aquatic and terrestrial species, particularly those of primary management concern.

Riparian habitats are important to fish, wildlife including giant garter snake, and waterfowl. The vision is to protect and expand riparian and riverine aquatic habitat, both forest and shrub, along creeks, drainage ditches, irrigation canals, and wetlands.

Remnant patches of high-quality riparian habitat will be protected. Areas of disturbed habitat will be restored where possible. Agricultural and grazing practices will be modified in riparian zones to encourage recovery of riparian and SRA habitat along the creeks. Improvements in stream flows will also benefit riparian zones. Riverine aquatic habitat is essential to spawning and rearing salmon and steelhead in the upper basins of Coon Creek, Auburn Ravine, and Secret and Miners Ravines. Stream channel and SRA habitat should be protected and enhanced.

FRESHWATER FISH HABITAT: Freshwater fish habitat is an important component needed to ensure the sustainability of resident native and anadromous fish species. The Lower American River is typical of a fall chinook salmon spawning stream (Moyle and Ellison 1991). The quality of freshwater fish habitat in the Lower American River will be maintained through actions directed at streamflows, coarse sediment supply, stream meander, natural floodplain and flood processes, and maintaining and restoring riparian and riverine aquatic habitats.

ESSENTIAL FISH HABITAT: The Lower American River has been identified as Essential Fish Habitat (EFH) based on the definition of waters currently or historically accessible to salmon (National Marine Fisheries Service 1998). Key features of EFH to maintain or restore in the Lower American River include substrate composition; water quality; water quantity, depth and velocity; channel gradient and stability; food; cover and habitat complexity; space; access and passage; and flood plain and habitat connectivity.

PERENNIAL GRASSLANDS: Upland habitats are important for waterfowl, giant garter snakes, and raptors such as the Swainson's hawk. The vision for upland habitats is to protect and expand around the outer edges of wetlands, and to restore grasslands and remnant oak woodland and oak savanna where possible.

AGRICULTURAL LANDS: Agricultural habitats are important to waterfowl and wildlife. The vision is to foster agricultural practices that provide valuable wildlife habitat. Where sufficient water is available, rice lands will be flooded after harvest rather than burned to provide winter waterfowl areas and reduced air pollution. Riparian and upland habitats

will be protected and expansion encouraged. Wildlife friendly agricultural practices will be encouraged.

VISIONS FOR REDUCING OR ELIMINATING STRESSORS

WATER DIVERSIONS: The vision for water diversions is to: 1) prevent loss of fish at diversion facilities; and 2) prevent the take of water from inhibiting the maintenance and/or restoration of riparian and riverine aquatic habitats. Water diversions from streams and adjacent marshes divert streamflow that is important to habitat and species of the unit. The vision is to reduce water diversions along creeks and floodways where possible to protect fish and enhance riparian and wetland habitats. Greater streamflows especially in drier years will provide for greater amounts of riparian habitat and sustain salmon and steelhead, as well as native resident fishes.

LEVEES, BRIDGES, AND BANK PROTECTION: Levee construction and bank protection have led to the loss of riparian, wetland, and shallow-water habitat along the river and adjacent marshes. The vision is to restore riparian vegetation along levees and protected banks. The vision is to selectively remove or setback levees and limit bank protection along streams and marshes to allow natural stream processes and habitat development.

INVASIVE RIPARIAN AND MARSH PLANTS: Invasive plant species can outcompete and displace valuable native species. Invasive plants often have little or no value to native wildlife and are destabilizing natural ecosystem functions and processes. The vision is that invasive plants will be controlled to allow native riparian plant species to naturally propagate.

CONTAMINANTS: Toxins continue to enter the river from municipal, industrial, and agricultural discharges. The toxins have had a demonstrated effect on the health, survival, and reproduction of waterfowl, fish, and wildlife. The vision is to reduce the input of toxins entering the streams and wetlands to improve health, survival, and reproduction of many important waterfowl and other wildlife, as well as reduce contaminant effects on fish in the American River, the Sacramento River, and the Bay-Delta.

HARVEST OF FISH AND WILDLIFE: The vision is to reduce or eliminate that illegal harvest of anadromous fish and to assure that legal harvest will not compromise efforts to rebuild fall-run chinook salmon and steelhead populations in the lower American River.

ARTIFICIAL PROPAGATION OF FISH: The vision for the artificial propagation of fish is that Nimbus Hatchery will contribute to the rebuilding of fall-run chinook salmon and steelhead populations without impairing the genetic identity of naturally spawning populations. Also, minimizing the interactions of wild and hatchery fish will contribute to reducing the potential for predation on and competition with the natural spawning populations.

STRANDING: The vision for stranding is to implement remedial measures that will reduce the frequency and extent of stranding losses within the American Basin Ecological Management Zone.

VISIONS FOR SPECIES

CHINOOK SALMON: The vision for chinook salmon is to recover all stocks presently listed or proposed for listing under ESA and CESA, achieve naturally spawning population levels that support and maintain ocean commercial and ocean and inland recreational fisheries. Fall-run chinook salmon will benefit from improved flows. Late winter and spring flows will provide attraction for downstream migrating fall-run chinook. Summer and fall base flow improvements will benefit over-summering juvenile steelhead as well as upstream migrating fall-run chinook salmon. Improvements in wetland, riparian, and SRA habitats; stream channel and meander; and gravel recruitment will also improve and fall-run chinook salmon spawning and rearing habitat. Screening unscreened and poorly screened diversions will improve young salmon production. Limiting harvest will help ensure adequate numbers of spawners.

STEELHEAD TROUT: The vision for steelhead trout is to recover this species listed as threatened under the ESA, and achieve naturally spawning populations of sufficient size to support inland recreational fishing and that use fully existing and restored habitat. Steelhead will benefit from improved peak flow events, especially in dry and normal years. Late winter, early spring flow events

will provide attraction for upstream migrating adults and support downstream migrating juveniles. Improved summer-fall base flows are needed to maintain over-summering physical habitat and lower water temperatures. Steelhead will also benefit from improved gravel spawning habitat, and stream rearing habitat, especially if summer river heating is reduced in the process. Screening unscreened and poorly screened diversions will improve young steelhead production. Limiting harvest to hatchery steelhead will help to protect wild steelhead.

STRIPED BASS: The vision for striped bass is to maintain healthy populations, consistent with restoring native species, to their 1960s level of abundance to support a sport fishery in the Bay, Delta, and tributary rivers. Striped bass will benefit from larger late winter, early spring flow events in the lower American River. The higher flow will provide upstream attraction flows and improve transport of eggs from spawning areas in the lower American and Sacramento Rivers.

AMERICAN SHAD: The vision for American shad is to maintain a naturally spawning population, consistent with restoring native species, that supports a sport fishery similar to the fishery that existed in the 1960s and 1970s. Improved spring flows should benefit American shad runs in the lower American River. Greater magnitude flow events in spring will provide attraction flows for adults to lower river spawning areas. Higher spring through fall base flows should improve spawning and early rearing, post-spawning adult survival, and juvenile shad survival and downstream migration.

SPLITTAIL: The vision for splittail is to achieve the recovery of this federally listed threatened species. ESA. Improvements in the riparian and stream meander corridors, wetlands, and floodplain overflow basins will improve spawning and early rearing habitat of splittail and other native resident fish species. Improved late winter and early spring flows will provide attraction flows for upstream migrating adult splittail from the Delta, and improve transport of larvae splittail downstream to the lower rivers and Bay-Delta.

WATERFOWL: The vision for waterfowl is to maintain and restore healthy populations at levels that can support consumptive (e.g., hunting) and nonconsumptive (e.g., birdwatching) uses, through

protection and improvement of habitats and reduction in stressors. Waterfowl will benefit from improved riparian corridors, floodplain overflow basins, and more wetlands.

NATIVE RESIDENT FISH: The vision for native resident fish species is to maintain and restore by distribution and abundance of species such as Sacramento blackfish, hardhead, tule perch, Sacramento sucker, and California roach.

LAMPREY: The vision for anadromous lamprey is to maintain and restore population distribution and abundance to higher levels than at present. The vision is also to better understand life history and identify factors which influence abundance. Better knowledge of these species and restoration would ensure their long-term population sustainability.

NEOTROPICAL MIGRATORY BIRDS: The vision for neotropical migratory birds is to maintain and increase populations through restoring habitats on which they depend.

GIANT GARTER SNAKE: The vision for the giant garter snake is to contribute to the recovery of this State and federally listed threatened species in order to contribute to the overall species richness and diversity. Achieving this vision will reduce the conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta. Protecting existing and restoring additional suitable wetland and upland habitats will be critical to achieving recovery of the giant garter snake. The proposed restoration of aquatic, wetland, riparian, and upland habitats in the American Basin Ecological Unit will help in the recovery of these species by increasing habitat quality and area.

SWAINSON'S HAWK: The vision for the Swainson's hawk is to contribute to the recovery of this State-listed threatened species to contribute to the overall species richness and diversity. Improvements in riparian and agricultural wildlife habitats will aid in the recovery of the Swainson's hawk. Increased abundance and possibly some nesting would be expected in the Delta as a result of improved habitat.

NON-NATIVE WARMWATER GAMEFISH: The vision for non-native warmwater gamefish is to maintain self-sustaining populations, consistent with

restoring native species, in order to provide opportunities for consumptive uses such as angling.

PLANT SPECIES AND COMMUNITIES: The vision for plant species and communities is to protect and restore these resources in conjunction with efforts to protect and restore wetland and riparian and riverine aquatic habitats.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

In restoring the stream channel and riparian habitats, close coordination is required with government agencies responsible for the lower American River and American Basin. The City and County of Sacramento, which administers the American River Parkway Plan, and the Secretary for Resources and the Secretary of the Interior, who administer the State and federal Wild and Scenic Rivers Acts, will be essential participants in the restoration program for the lower American River. In addition, the Corps and the Sacramento Area Flood Control Agency are responsible for ensuring the flood control capacity of the river and American Basin is retained, while retaining as much as possible the ecological resources of the river. Both agencies are cooperating to develop plans to improve habitat and flood control on the lower river and American Basin.

The following list includes the most active programs in the American Basin Ecological Management Zone that can contribute to restoring ecological health to the basin. Attaining the visions described above for the American River will require cooperative and coordinated efforts on the part of stakeholders and agencies with management interests in the river.

CENTRAL VALLEY HABITAT JOINT VENTURE

The Central Valley Habitat Joint Venture is a component of the North American Waterfowl Management Plan of the USFWS with funding and cooperative projects of the federal, State, and private agencies. New sources of funding including CALFED restoration funds are being sought to implement the Joint Venture. The Joint Venture has adopted an implementation plan that includes the American Basin. Objectives include protection of wetlands through acquisition of fee-title or conservation easements, enhancement of waterfowl habitat in

wetlands and agricultural lands. The objectives and targets of the Joint Venture have been adopted by the ERPP.

SACRAMENTO WATER FORUM

The Water Forum is a diverse group of business and agricultural leaders, environmentalists, citizen groups, water managers, and local governments. Together, the participants in the Water Forum have agreed upon two co-equal objectives for the lower American River to address future water shortages, environmental degradation, contamination, threats to groundwater reliability, limits to economic prosperity, and competition for American River water. The dual Water Forum objectives are to: 1) provide a reliable and safe water supply for the region's economic health and planned development through to the year 2030; and 2) preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

Important elements sponsored by the Water Forum that will contribute to improving ecological health of the lower American River include an improved pattern of fishery flow releases from Folsom Reservoir and habitat mitigation. The flow pattern being developed will be 'fish friendly' and would significantly benefit fall-run chinook by improving river flows and temperatures at critical times. Changes in the operations of the water release shutters at the power penstocks of Folsom Dam is anticipated to improve water temperatures in the lower American River in summer and fall. In addition, the Water Forum, in partnership with other management agencies on the lower American River, is proposing a series of fishery studies and pilot projects to determine what additional operations, modifications, and mitigation projects should be implemented to help restore lower American River chinook salmon and steelhead populations.

AMERICAN RIVER OPERATIONS GROUP

The American River Operations Group is composed of representatives of fishery agencies, water agencies, local governments, and stakeholders. The Ops Group meets regularly to identify and recommend actions involving water operations on the American River that will optimize conditions for steelhead and chinook salmon.

SACRAMENTO AREA FLOOD CONTROL AGENCY (SAFCA)

SAFCA with other resource agencies and private entities is developing a Floodway Management Plan (FMP) for the lower American River. A Lower American River Task Force has been working toward developing a FMP that provides protection to resources in the floodway. Their focus is on protection and restoration of riparian habitat in the floodplain of the lower American River. SAFCA is also active in protecting and restoring habitat in the Natomas Basin of the American Basin Ecological Management Unit. Planning efforts are being conducted to improve flood protection for the Natomas Basin. SAFCA has developed a Natomas Area Flood Control Improvement Project that provides additional levee protection and surface transport of floodwaters, and also addresses special status plant and animal species, vernal pool and wetland habitats, and upland and riparian habitats.

SAFCA has funded extensive work on designing environmental features into bank protection projects. SAFCA and the U.S. Army Corps of Engineers continue to develop habitat conservation/mitigation/enhancement elements to be incorporated into the levee improvement and bank protection program for the Lower American River. These elements include design and construction of multi-stage bench areas at specific water surface elevations in order to provide littoral rearing habitat for salmonids, as well as increasing the habitat complexity and diversity in portions of the Lower American River.

NATOMAS BASIN HABITAT CONSERVATION PLAN (HCP)

A habitat conservation plan was developed in 1996 to provide a practical program to promote biological conservation along with economic development and continuation of agriculture in the Natomas Basin, the south-west subunit of the American Basin Ecological Management Unit. The program outlined in the Plan establishes a multi-species, multi-habitat conservation program to mitigate the expected loss of habitat values and incidental take of protected species that would result from urban development, operation of irrigation and drainage systems, and agricultural activities in the Natomas Basin. Funds are obtained

from developers to purchase habitat reserves and conduct studies. The HCP establishes a Natomas Basin Conservancy to cover activities associated with managing reserves, populations status surveys, and general scientific research. The HCP covers wetlands, riparian, and upland habitats and associated plant and animal species, and does not cover aquatic habitat or fish species.

COORDINATED RESOURCE MANAGEMENT AND PLANNING (CRMP)

CRMP programs are being established at least for the Auburn Ravine Creek watershed. Coordinated land management and planning activities are being undertaken between agencies and private entities and MOU's developed to focus on water quality, fisheries improvement, and fire safe communities in order to promote public safety, watershed stability, and high quality waters in Auburn Ravine through cooperation, information development, and education. The CRMP deals with erosion and sedimentation, habitat quality, habitat loss and depletion of biodiversity, rural homes and fire hazards, and the need to maintain overall stability of the watershed. Watershed quality is to be improved through forest fuels management, preventing discharge of pollutants, sustaining fish and their habitats, and creating and sustaining diverse habitat and wildlife diversity. The role of the creek for conveying irrigation water and as a flood channel are also to be protected.

CALFED BAY-DELTA PROGRAM

CALFED has funded two ecosystem restoration projects in the American River Basin. One project developed a watershed plan for the American River. Another Restoration project planned watershed restoration actions on the Middle and North Forks of the American River, Auburn Ravine Creek, and Coon Creek.

CENTRAL VALLEY PROJECT IMPROVEMENT ACT

The CVPIA added 'mitigation, protection and restoration of fish and wildlife' as a purpose of the Central Valley Project and required the implementation of a program that makes all reasonable efforts to increase the natural production of

anadromous fish in Central Valley rivers and streams to not less than twice the average levels present from 1967-1991.

The U.S. Fish and Wildlife Service and the Bureau of Reclamation are implementing the CVPIA which provides for restoration of habitats and species and minimization of stressors. Key elements of the CVPIA program include the Anadromous Fish Restoration Program (USFWS 1995) and the Anadromous Fish Screening Program. Other elements are directed at spawning gravel replenishment on the lower American River, water acquisition, and other measures that will contribute to restoring the health of the Sacramento River and Sacramento-San Joaquin Delta Ecological Management Zones.

Activities with direct application to the American Basin include a program to restore small tributaries to the Sacramento River. Local entities such as Resource Conservation Districts are being funded to identify problems, develop solutions, and implement actions to address small-scale restoration projects on tributary streams. CVPIA's Comprehensive Assessment and Monitoring Program (CAMP) is funding efforts to provide information on the anadromous fish runs in tributary streams. Funding is also being provided for regional conservation planning of watersheds in the basin that support salmon and steelhead. Funding is also available for evaluating the potential contribution of intermittent tributary streams like those in the American Basin as spawning and rearing habitat for chinook salmon. Funding is also available to reduce fish passage and screening problems.

A Water Management Plan is being developed to guide water supply development for anadromous fish under CVPIA's 3406(b)(2) and (b)(3) projects. Dedicated CVP water and supplemental water purchased from willing sellers will be used to enhance flows for anadromous fish. Such water supply can be used to enhance salmon and steelhead populations in American Basin streams and in the lower American River.

SALMON, STEELHEAD TROUT AND ANADROMOUS FISHERIES PROGRAM ACT

Established in 1988 by Senate Bill 2261, this Act directs the California Department of Fish and Game to implement measures to double the numbers of salmon and steelhead present in the Central Valley (DFG 1993, 1996). The Department's salmon and steelhead restoration program includes cooperative efforts with local governments and private landowners to identify problem areas and to assist in obtaining funding for feasibility studies, environmental permitting, and project construction. Reaching the goals and targets developed to restore ecosystem functions of the American River Basin and the associated biotic community will require close coordination among State, federal, and local agencies, with participation by water developers and stakeholders.

PLANNING BY CITIES AND COUNTIES

The cities of Roseville, Auburn, Lincoln, Rocklin, and Sacramento, and the counties of Sutter, Sacramento, and Placer are all involved in planning activities that related to ecological resources and restoration in the American Basin Ecological Management Zone. Activities include a Roseville Regional Wastewater Treatment Service Area Master Plan that involves collection, treatment, and disposal of waste water, water quality, and public health. Cities and Counties of the Basin are pressed with the need to conserve biological resources, habitats, and ecosystem quality, while addressing large scale growth and land use changes in the cities and counties that may affect the flood capacity, water quality, and general environmental health of the watersheds.

LINKAGE TO OTHER ECOLOGICAL MANAGEMENT ZONES

Many of the habitats, processes, and stressors found within this Ecological Management Zone are similar to those found in the Feather/Sutter, Cosumnes, Delta, Yolo Basin, and Colusa Basin Ecological Management Zones. Efforts within one Ecological Management Zone should be similar to those in

adjacent zones providing connectivity where needed and cumulative benefits to the system.

RESTORATION TARGETS AND PROGRAMMATIC ACTIONS

ECOLOGICAL PROCESSES

CENTRAL VALLEY STREAMFLOWS

TARGET 1: Develop and implement an ecologically based streamflow regulation plan for the American Basin creeks and lower American River. The lower American River should meet the recommended minimum flows and flow targets for the lower American River (presented in Tables 8 and 9). Lower American River flow events should be coordinated with similar flows that occur naturally in the Sacramento Valley and with storage releases from Shasta and Oroville Reservoirs (◆◆◆).

PROGRAMMATIC ACTION 1A: Provide target flows by modifying CVP operations and acquiring water as needed from willing sellers, with consideration given to reservoir available carryover storage and flows needed to meet needs determined by the water temperature objective discussed under Target 3 below.

PROGRAMMATIC ACTION 1B: Develop and implement a comprehensive watershed management plan for the American Basin and lower American River to protect the channel (e.g., maintain flood control capacity and reduce bank erosion) and preserve and restore the riparian corridor. Upper watershed health should be improved by reducing the potential for wildfire and implementing other watershed improvement practices to protect streamflows, stream channel morphologies, spawning gravel condition, and riparian habitats, and minimize sediment input to the stream.

PROGRAMMATIC ACTION 1C: Acquire water from willing sellers to augment river flow during dry years to provide fishery benefits.

TARGET 2: Minimize flow fluctuations below Nimbus Dam that can dewater salmonid redds and reduce survival of juvenile anadromous fishes due

Table 9. Average Monthly Minimum Flow Targets (cfs) on the American River.

Month	Water-Year Type			Critical Relaxation
	Wet	Above and Below Normal	Dry and Critical	
October	2,500	2,000	1,750	800
November-February	2,500	2,500	1,750	1,200
March-May	4,500	3,000	2,000	1,500
June	4,500	3,000	2,000	500
July	2,500	2,500	1,500	500
August	2,500	2,000	1,000	500
September	2,500	1,500	500	500

Table 10. Average Flow Targets for 10-Day Pulse (cfs) on the American River, Coordinated with Flows from Shasta and Oroville Reservoirs.

Month	Water-Year Type			Exceptions
	Wet	Above and Below Normal	Dry	
March	6,000-7,000	4,000-5,000	3,000-3,500	Only when inflows are sufficient
Late April or early May	7,000-8,000	5,000-6,000	3,500-4,000	Only when inflows are sufficient

to stranding and/or isolation from the main channel. (◆◆◆).

PROGRAMMATIC ACTION 2A: Complete on-going collaborative efforts to develop flow ramping criteria and operationally implement these criteria to reduce adverse affect of flow fluctuations on lower American River fishery resources.

PROGRAMMATIC ACTION 2B: To minimize dewatering of salmon and steelhead redds, flows exceeding 2,500 cfs after the onset of chinook salmon spawning should be maintained at least at this level until April 30.

TARGET 3: Provide flows of suitable quality water that more closely emulate natural annual and seasonal streamflow patterns in American Basin watersheds (◆◆).

PROGRAMMATIC ACTION 3A: Enter into agreements with water districts and wetland managers to provide return flows of high quality water from irrigated agriculture and seasonal wetlands to the American Basin.

PROGRAMMATIC ACTION 3B: Enter into agreements with landowners and water districts to limit diversions of natural flows from creeks to improve stream flows.

PROGRAMMATIC ACTION 3C: Limit diversion of natural stream flows from American Basin creeks into irrigation canals and ditches by providing other sources of water or through purchase of water rights from willing sellers.

RATIONALE: Natural streamflow patterns are important in maintaining geomorphology of watersheds, as well as riparian and floodplain vegetation along stream banks. Streamflow is also essential for the well being of valley wetlands and for upstream passage of adult anadromous fish, spawning, successful rearing, and downstream migration of juveniles. In addition, streamflows influences stream channel morphology, riparian communities, and fish habitat. Base flows and flow events will be provided by releasing water from Folsom Reservoir, reducing diversions from the American River. Flood-control releases from Folsom